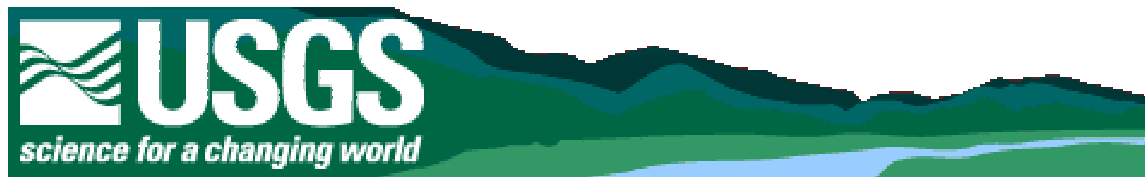


Great Lakes Beach Conference

February 6-8, 2000

Chicago Case Study



An aerial photograph of Chicago's shoreline, showing the city skyline in the background, a large body of water in the middle ground, and a sandy beach with some buildings and greenery in the foreground.

Chicago's Shoreline & Beaches

- 26 miles of shoreline
- 32 beaches
- Recreational uses
(boating, swimming,
etc.)
- Over 25 million
visitors each year

Case Study: 63rd St. Beach

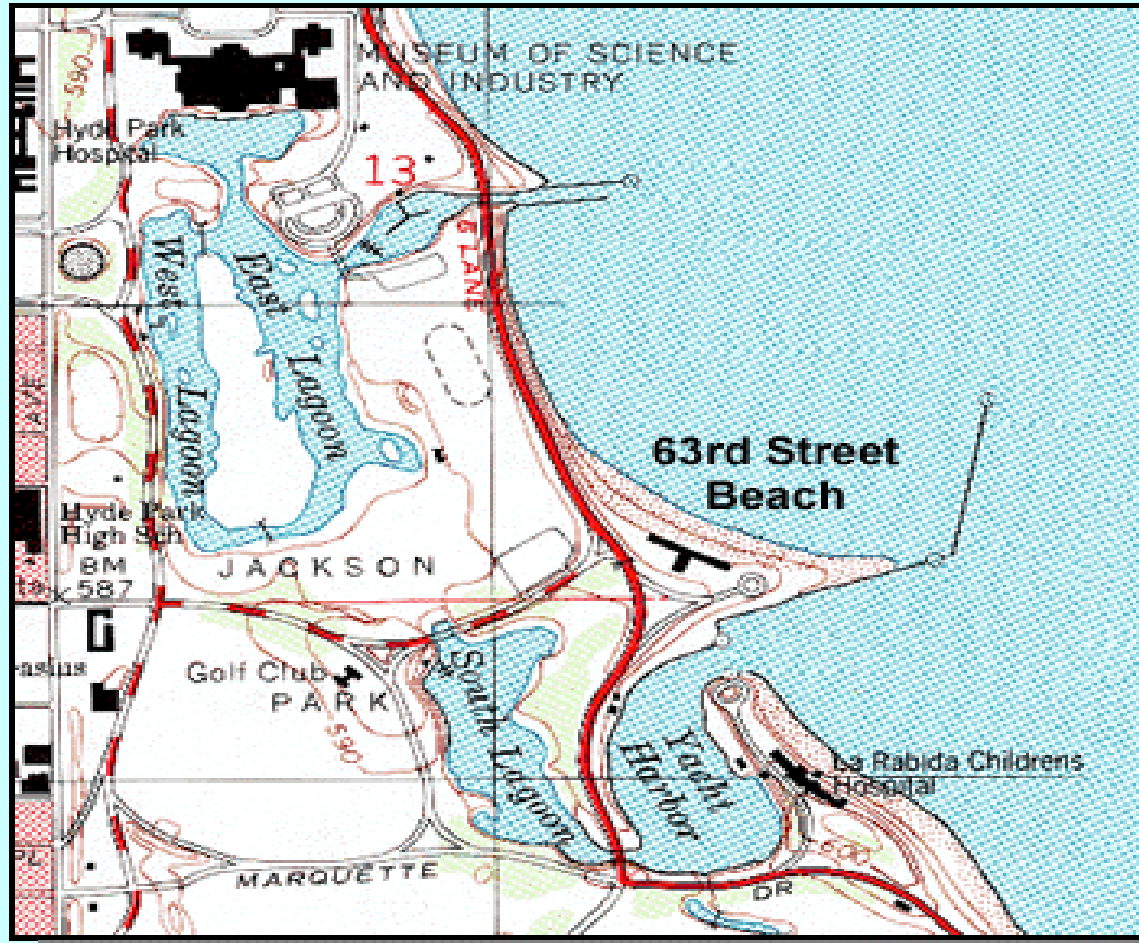
Chicago, Illinois

- Excessive beach closures in 1999
- Discovery & repair of leaking sewer
- Design & execution of extensive sampling program with USGS from April-Sept 2000



Case Study: 63rd St. Beach

Overhead View of 63rd St. Beach



Case Study: 63rd St. Beach

Objectives

- Find all sources contributing to *E. coli* levels & mitigate those sources
- Find predictors/indicators of high *E. coli* levels
- Better public health protection via new test methods & models

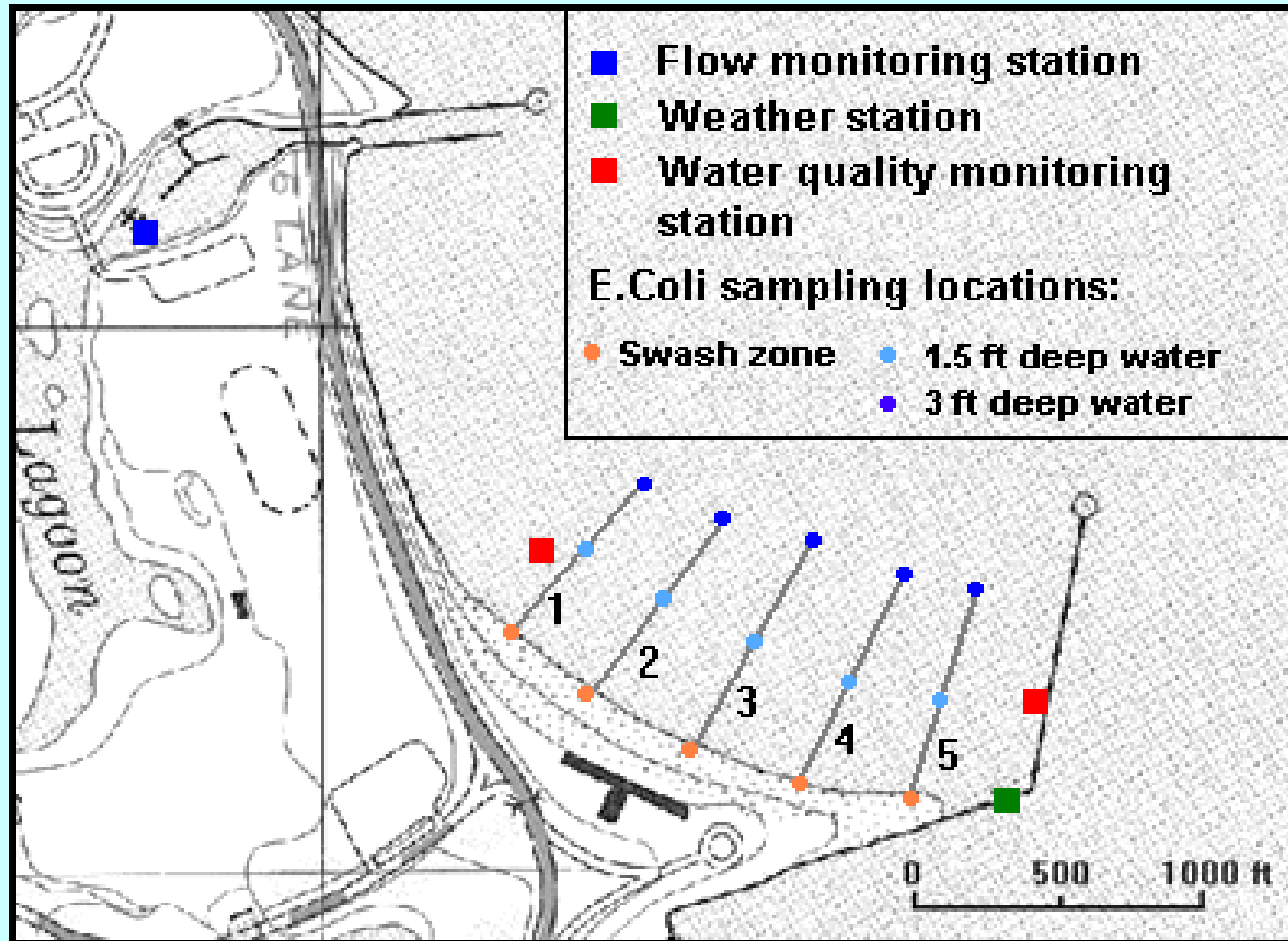
Case Study: 63rd St. Beach

Methodology

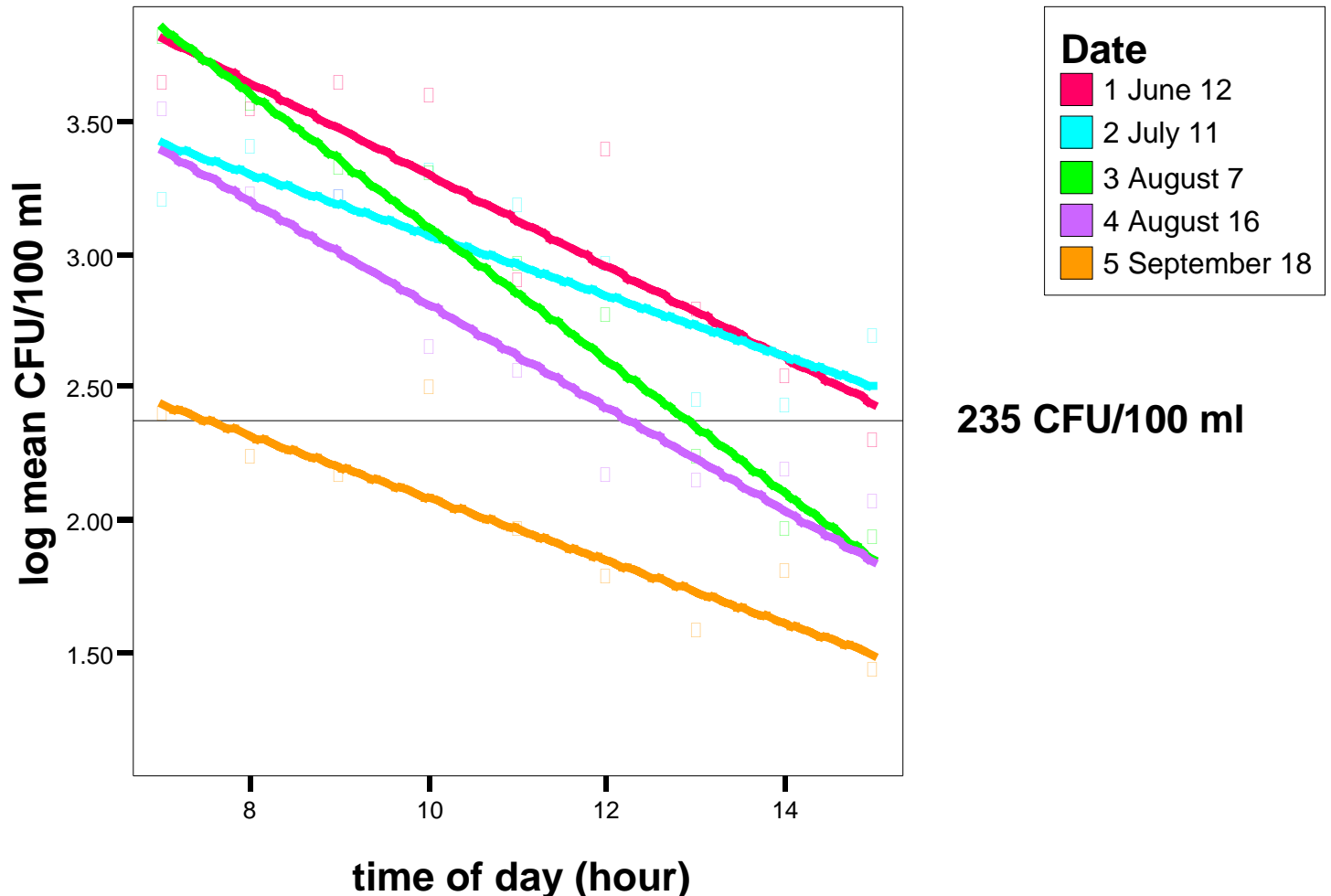
- **Over 3,000 samples collected**
 - ↗ **1.5 ft, 3.0 ft depth**
 - ↗ **Five transects**
 - ↗ **Daily, hourly, replicates**
 - ↗ **Light/dark bags**

Case Study: 63rd St. Beach

Sampling/Monitoring Locations



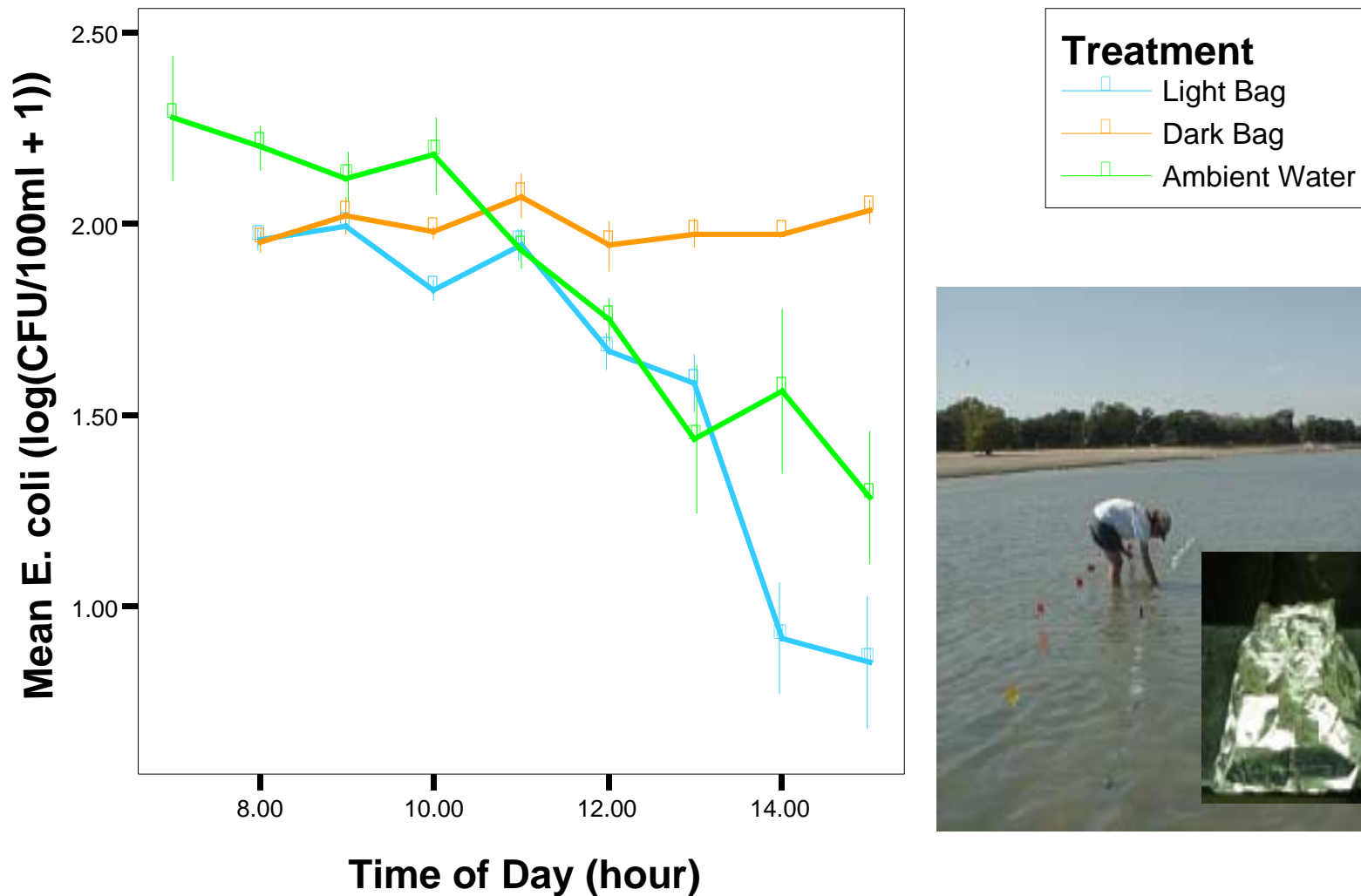
Hourly *E. coli* Concentrations 63rd St. Beach, Chicago, 2000



Results of Light/Dark Bag Experiment

63rd St. Beach, Chicago

September 18, 2000



Case Study: 63rd St. Beach

Methodology (continued)

- **DNA testing conducted on select samples**
 - **Water, sediment, gull droppings**
 - **Water samples tested for wastewater chemicals (solvents, pesticides, cholesterol, etc.)**

Case Study: 63rd St. Beach

Methodology (continued)



- Sand removal & replacement
 - May 2000
 - Top 6 inches



Case Study: 63rd St. Beach

Methodology (continued)

- Temporary pumps installed
 - August 2000
 - Increase circulation



Case Study: 63rd St. Beach

Equipment

- Equipment installed for monitoring physical & chemical properties of beach water
 - Weather station (wind speed, wind direction, temperature, rainfall, etc.)
 - Doppler flow meter (measures flow of surface water in/out of lagoon)
 - YSI probes with datalogger (dissolved oxygen, pH, turbidity, etc.) reading every 15 minutes

Case Study: 63rd St. Beach

Equipment



Weather station



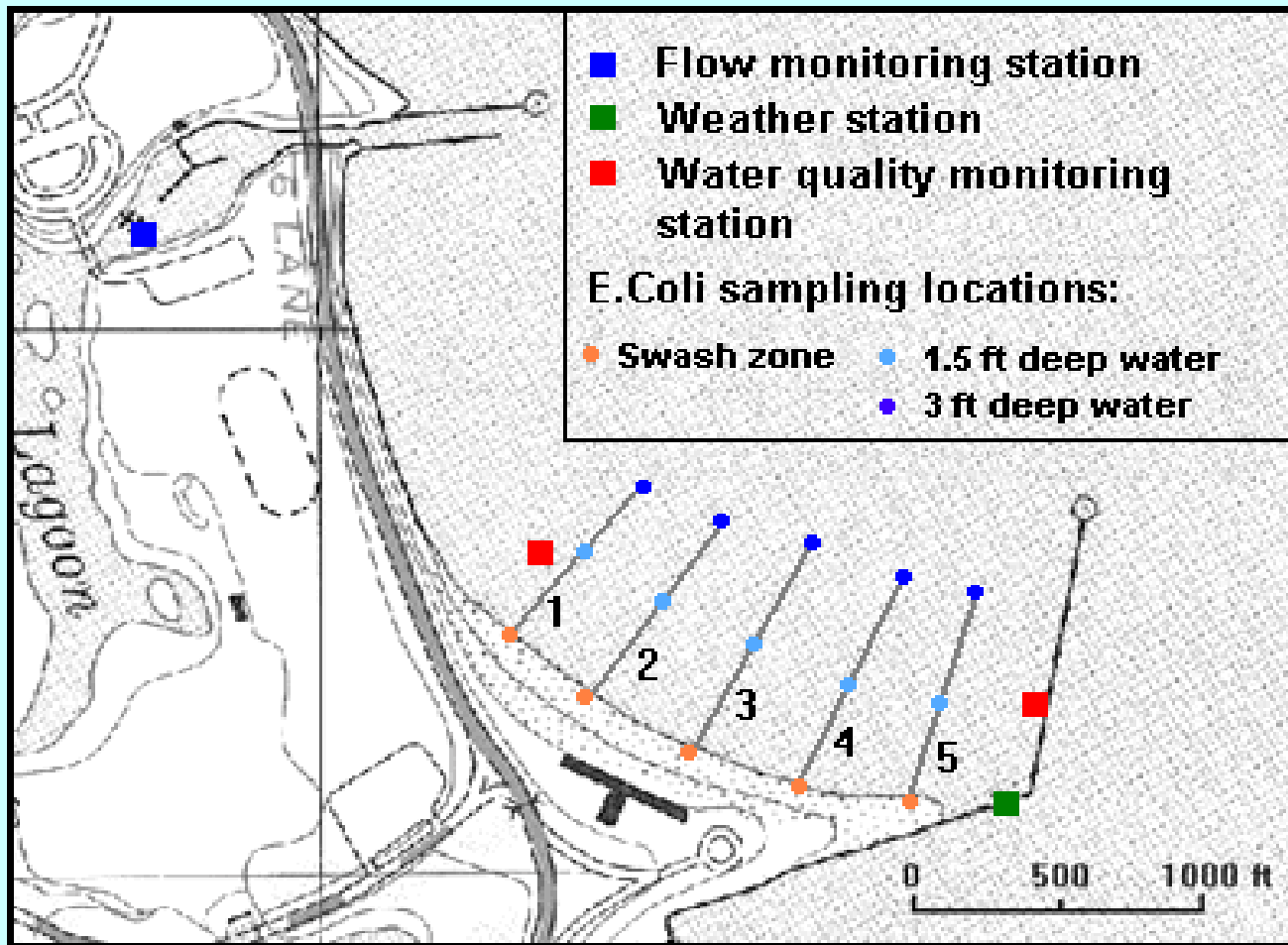
Doppler flow meter



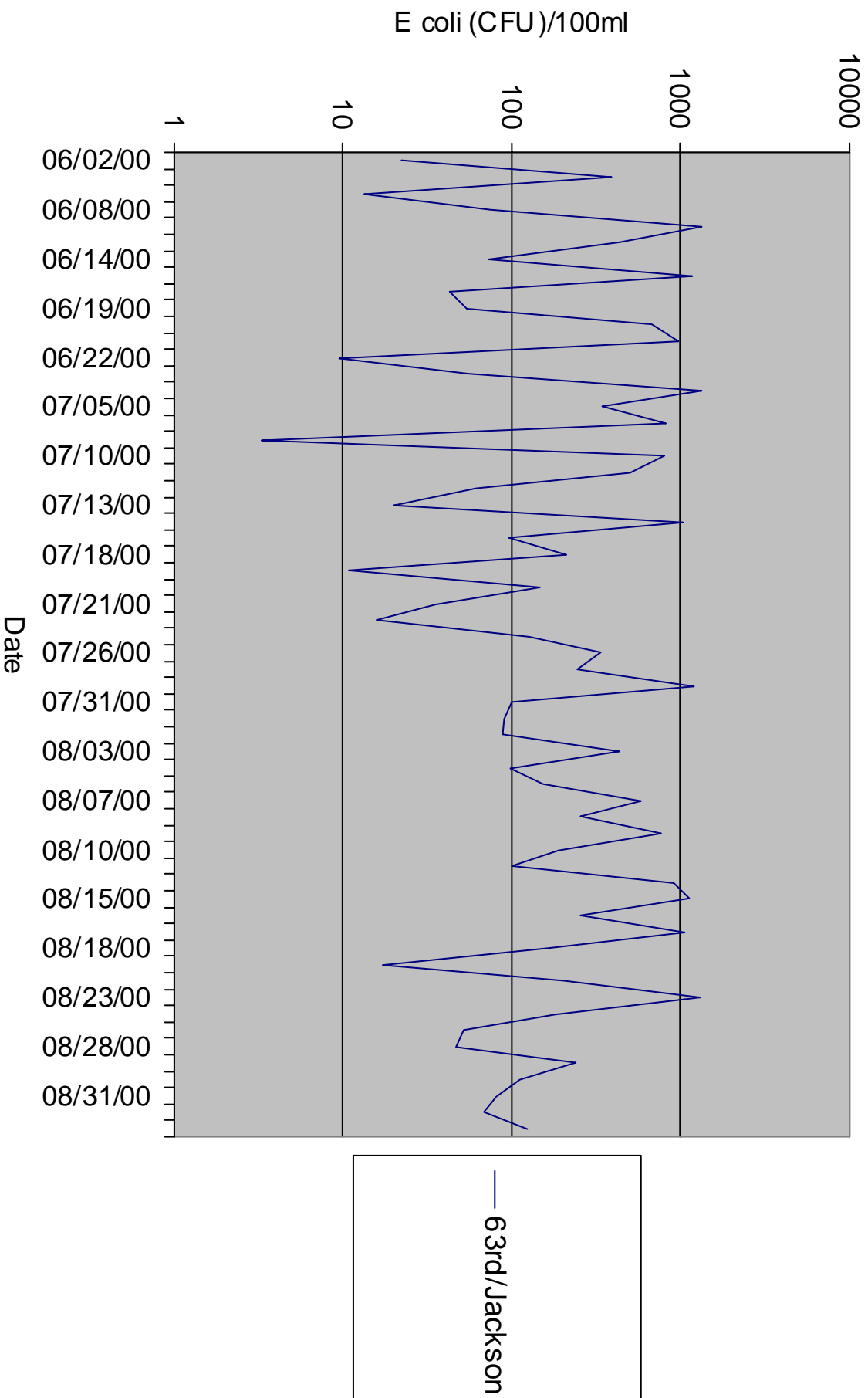
YSI probe

Case Study: 63rd St. Beach

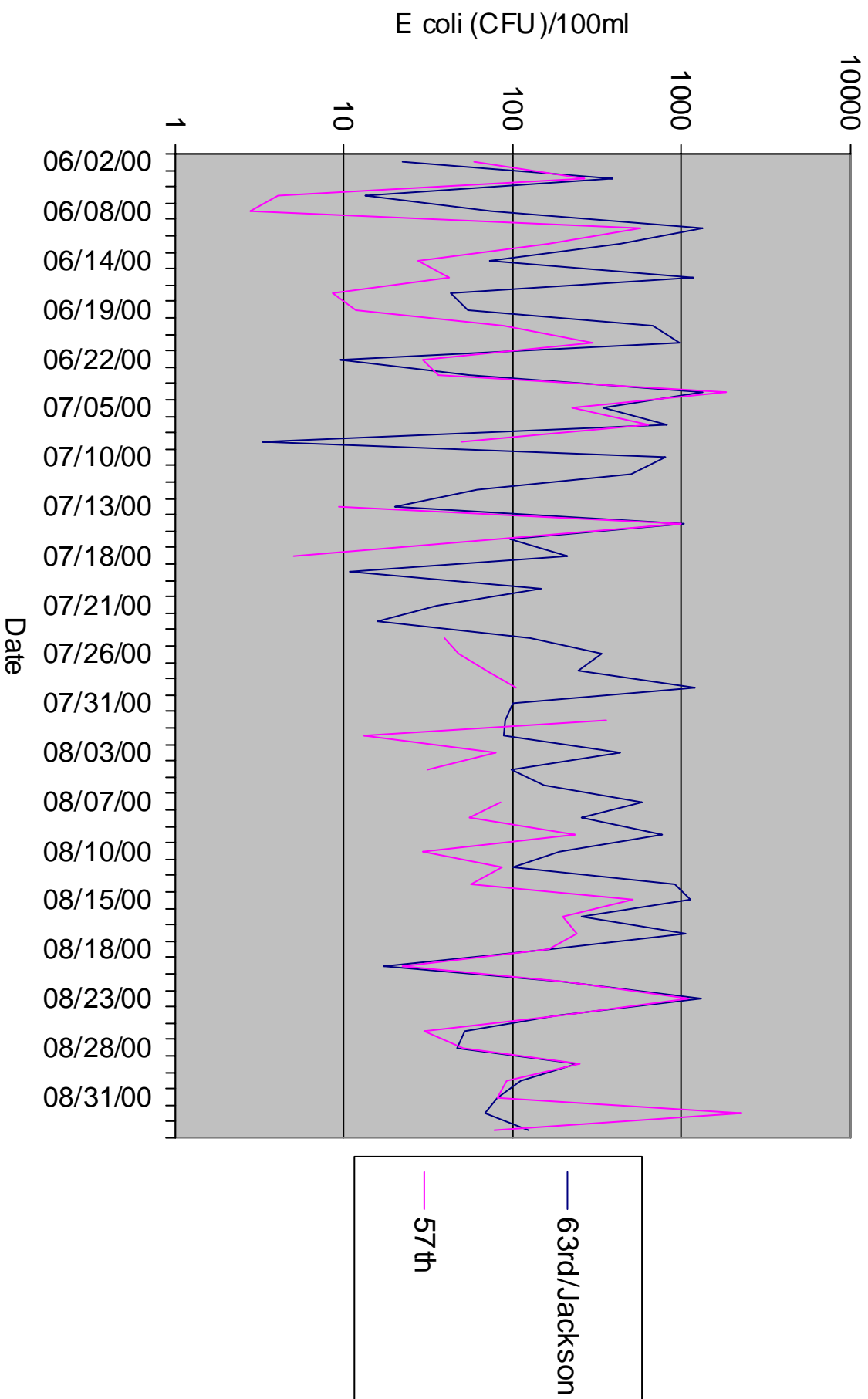
Sampling/Monitoring Locations



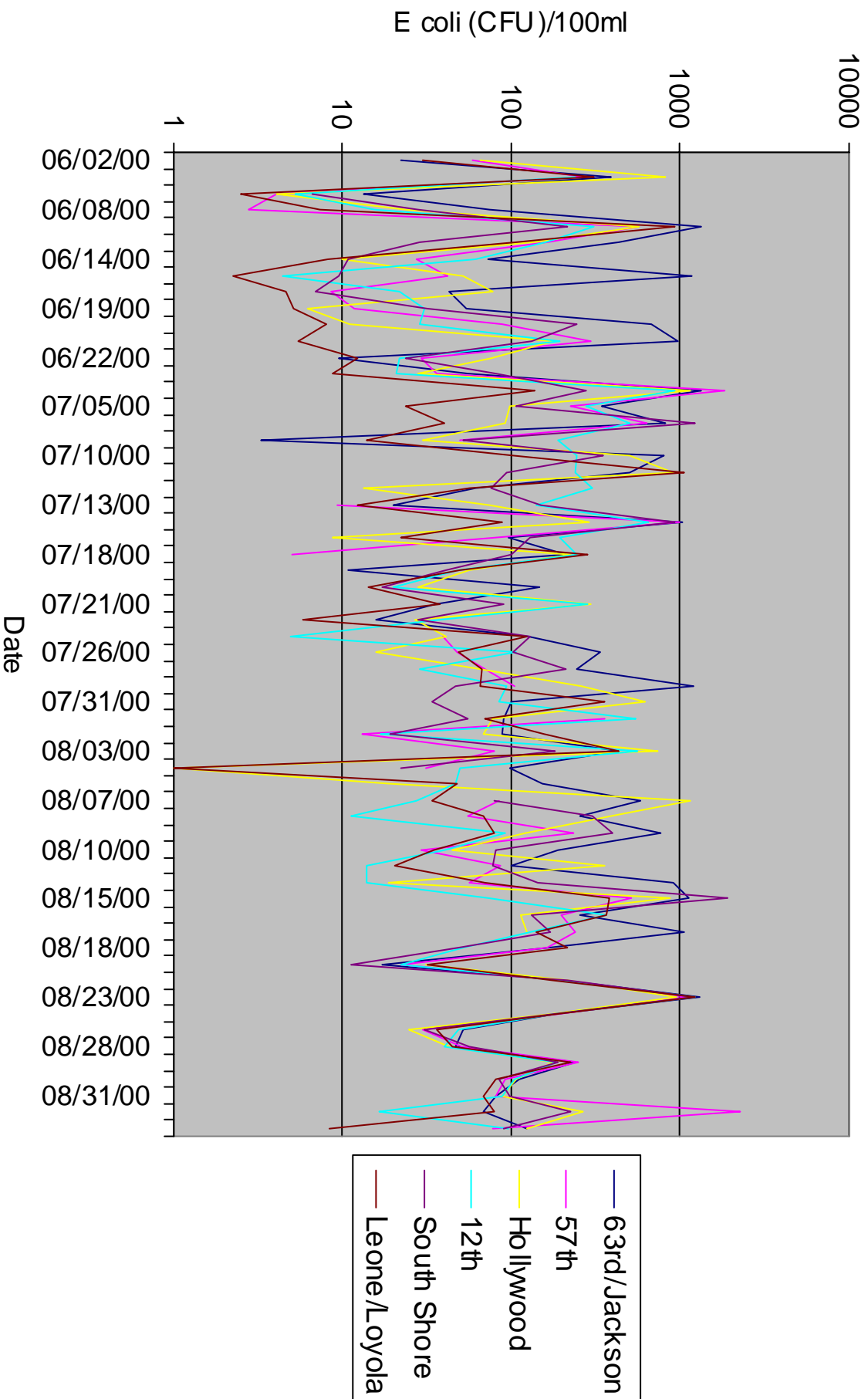
Summer 2000 *E. coli* Concentrations, 63rd St. Beach



Summer 2000 *E. coli* Concentrations, 63rd St. & Adjacent Beaches



Summer 2000 *E. coli* Concentrations, 63rd St. & Adjacent Beaches



Case Study: 63rd St. Beach

Conclusions

- **Failing infrastructure can be a major source:**
 - **2000: 08 closures**
 - **1999: 22 closures**
 - **Average closures for beaches between 5-7**
- **Tests results indicated other sources contributing to *E. coli* (animals, food, run-off)**
- **Chemical tests indicated substances from storm & urban run off (fumigants, insect repellants, & fire retardant)**

Case Study: 63rd St. Beach

Conclusions (continued)

- **Hourly samples showed a decrease in *E. coli* concentration over the course of day**
- ***E. coli* levels were higher in shallow waters vs. deep, warm waters**
- ***E. coli* reduces with exposure to sunlight**
- **Movement of water is downward into the sand (except swash zone)**
 - ***E. coli* in swash zone & water movement may be a link between resident sand *E. coli* populations & water contamination**
- **Correlation among *E. coli* levels, storm events, & associated high winds & waves**

Case Study: 63rd St. Beach

Methodology: Design of Predictive Modeling

- **Considers:**
 - Atmospheric conditions
 - Biochemical characteristics
 - Physical characteristics
- **Test preliminary model during 2001 beach season**
 - 79% predictability

Management Options

- **Manage all potential sources**
 - **Animals/pets/birds**
 - **Food**
 - **Increasing refuse pick-up/closed containers**
 - **Designate areas of use**
- **Improve water quality in swimming areas**
 - **Design**
 - **Water circulation**
 - **Long currents**

Maintenance & Testing to Ensure Public Health & Safety

- Operations
 - Adequate number of samples
 - Cleaning sandy/beach area
- Managing designated public areas
 - Water
 - Sand
 - Grass

Preparation for Beach Openings

- **Annual infrastructure inspection**
 - **Buildings**
 - **Subsurface**
- **Beach management**
 - **Initial & continual cleaning/grooming of beaches**
 - **Beach nourishment (import or removal of sand)**
- **Water testing program**

Communicating Human Health Risk

- **Notification by beach managers**
- **Information hotline**
- **Web site**
- **Media (TV, radio, newspapers)**
- **Alternative programs available**



Summary

- Multiple sources contribute to limited swimmability
- A pre-beach season maintenance program is important
- Communicating beach issues is pertinent to keeping the public informed

Acknowledgements

- Chicago Department of Environment
- Chicago Park District
- United States Geological Survey
- Chicago Department of Water
- Chicago Department of Sewers
- United States Environmental Protection Agency
- Alderman Leslie Hairston

